Claims

1. Stabilised superparamagnetic particles comprising superparamagnetic single domain particles of iron hydroxide or iron oxihydrate or iron oxides or iron mixed oxide or iron having a particle size ranging between 2 and 50 nanometers, or aggregates thereof having a particle size ranging between 10 and 1000 nanometers, or mixtures thereof, respectively stabilised on their surface by means of aliphatic dicarbon or polycarbon acids or derivatives thereof, which stabilised acids or derivatives prevent an aggregation and sedimentation in gravity, characterised in that the superparamagnetic single domain particles carry charged ions of chemical elements bonded to their surface.

2. Particles according to Claim 1 wherein the ions are positively charged metal ions selected from the group consisting of ions of the chemical elements copper, silver, gold, iron, nickel, cobalt, gallium, thallium, bismuth, palladium, rhenium, rhodium, ruthenium, platinum, technetium, indium, iridium, osmium, radium, selenium, vanadium, yttrium, zirconium, rare earths, mixtures of said positively charged metal ions and radioactive isotopes of said elements.

3. Particles according to Claim 2 wherein the metal ions are selected from the group of radioactive isotopes consisting of ^{52}Fe, ^{67}Ga, ^{99m}Tc, ^{113}in, ^{188}Rh, ^{192}Ir, ^{198}Au, ^{201}Tl and ^{223}Ra.

4. Particles according to Claim 2 wherein the positively charged metal ions are selected from the group consisting of metal ions of the chemical elements copper, silver, gold, platinum, palladium, osmium, rhenium, rhodium, ruthenium, vanadium and mixtures of said metal ions.

5. Particles according to Claim 1 wherein the charged ions are non-metal ions which non-metal ions are bonded by means of a polyethylenimine bridge to the surface of the superparamagnetic single domain particles.

6. Particles according to Claim 5, wherein the charged ions are those of the radioactive isotopes ^{13}N, ^{15}O, ^{18}F, ^{123}J or mixtures of said radioactive isotopes.

7. Particles according to Claim 1 wherein the superparamagnetic single domain particles are stabilised on their surface by means of malic acid, tartaric acid, citric acid, aspartic acid or mixtures thereof.

8. Particles according to Claim 1 wherein the superparamagnetic single domain particles and the particles of the stable and degradable aggregates comprise iron, iron hydroxide, iron oxihydrate, γ-Fe_2O_3, Fe_3O_4, the iron mixed oxides of the general formula $mMO.nFe_2O_3$ wherein M refers to the bivalent metal ions Fe, Co, Ni, Mn, Be, Mg, Ca, Ba, Sr, Cu, Zn, Pt or mixtures of said bivalent metal ions or comprise the mixed oxides of the general formula $mFe_2O_3.nMe_2O_3$ wherein Me refers to the trivalent metal ions Al, Cr, Bi, rare earths or mixtures thereof wherein m and n are whole numbers ranging from 1 to 6.

9. Particles according to Claim 1 wherein the superparamagnetic single domain particles comprise on their surface in addition to the stabilising carbon acids and the positively charged ions of chemical elements a tissue-specific bonding substance or a pharmacologically active substance or a mixture of said tissue-specific bonding substance or a pharmacologically active substance.

10. Particles according one of the Claims 1 to 9 wherein the R_1-relaxivity of the superparamagnetic single domain particles lies in the range from 2 to 50 and the ratio of the relaxivities R_2/R_1 is less than 5.

11. Method for the manufacture of stabilised superparamagnetic particles according to Claim 1 from carbon acid-stabilised single domain particles or their aggregates which comprises mixing the stabilised superparamagnetic single domain particles and aggregates or mixtures thereof with solutions containing ions of chemical elements wherein the concentration of the solutions lies in the range from 0.001 millimolar to 1 molar and wherein further the ratio of ions of chemical elements to iron is <10 mol-% and wherein the temperature is 5 to 70 °C and subsequently the particle dispersion is rid of excess ions.

12. Method according to Claim 11 wherein for the manufacture of stabilised particles with non-metal ions before mixing with the superparamagnetic particles the solutions having the non-metal ions are brought into contact with a polyethylenimine or the superparamagnetic particles treated with polyethylenimine are brought into contact with solutions that contain non-metal ions.

13. Pharmacologically active preparation comprising a pharmacologically acceptable carrier and superparamagnetic single domain particles or aggregates according to Claim 1 to which particles or aggregates are bonded stabilising aliphatic dicarbon or polycarbon acids or derivatives thereof, which stabilising aliphatic dicarbon or polycarbon acids or derivatives prevent an aggregating and sedimenting in gravity and which additionally carry positively charged ions of chemical elements bonded to their surface.

14. Preparation according to Claim 13 wherein the single domain particles of the aggregates comprise coupled to the stabilising carbon acid(s) in addition to the stabilising carbon acid and the

metal ions a tissue-specific bonding substance or a pharmacologically active substance or a mixture of said tissue-specific bonding substance or a pharmacologically active substance.

15. Use of the stabilised superparamagnetic particles according to Claim 1 as bacteriostatic or radiopharmaceutical agent for the purpose of tumour destruction for the prevention of restenosis, for the combating of inflammatory diseases, for the control of organ functions, for the purpose of magnetic drug targeting, as MR contrast agents, as magnetic ion exchangers and magnetic adsorbents for separation procedures, for the manufacture of extremely small metal particles as magnetic particles for in vitro diagnosis, optionally under the action of magnetic fields.